SUMMARY

S.1 Introduction

This study addresses proposed alternatives for a comprehensive solution to flood control problems in the Sacramento area, and ecosystem restoration at Folsom Dam and selected sites along the Lower American River. The study is part of the Federally authorized American River Watershed Investigation. The two classes of flood control alternatives are modifying levees to increase American River conveyance capacity through Sacramento, and increasing flood control storage through enlargement of Folsom Dam and Reservoir.

This document and its technical appendices will support decision making by the U.S. Army Corps of Engineers (Corps) and the non-Federal sponsors: the State of California Reclamation Board (Reclamation Board) and the Sacramento Area Flood Control Agency (SAFCA). The study also ensures compliance with the National Environmental Policy Act (NEPA), the California Environmental Quality Act (CEQA), and other pertinent laws and regulations. This report presents a summary of information developed to date on without-project, present, and future conditions; flood control and ecosystem restoration problems and opportunities; the alternative formulation process, including a description and comparison of project alternatives; and an evaluation of the environmental effects of these alternatives.

The study has been prepared by the Sacramento District of the Corps with close coordination by the Reclamation Board and SAFCA. Preparation of the study has also been coordinated closely with the U.S. Bureau of Reclamation (Bureau), the Federal agency with responsibility for operating Folsom Dam, and the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, two agencies that ensure environmental compliance. The Reclamation Board serves as the State lead agency for CEQA purposes.

This long-term study supplements the 1996 Supplemental Information Report (SIR) and the 1991 Feasibility Report for the American River Watershed Investigation. This study includes the following:

- A supplemental inventory and forecast of existing and future conditions in the study area
- Background information on flood problems and potential solutions in the Sacramento area
- Description of the formulation and evaluation of the alternative plans, along with a comparison of the plans
- Current information on the costs and benefits for Folsom Dam enlargement and downstream levee modification measures and plans
- Updated cost and benefit information on the previously considered upstream detention dam

- Description of the environmental effects of the alternatives
- Plan implementation requirements

S.1.1 Authorization

Study of the American River watershed was authorized in the Flood Control Act of 1962 (Public Law 87-874) with direction from Congress given to the Corps to survey for flood control and allied purposes. Although Congress authorized the overall study of the American River watershed under this act, specific direction for the current long-term study was more recently provided by Section 566 of the Water Resources Development Act (WRDA) of 1999 (Public Law 106-53).

S.1.2 Project Background

A serious flood problem exists in the Sacramento area. Although extensive flood control work has been accomplished and additional work is scheduled for the next 7 years, a need exists for additional flood protection. There is also a need to preserve and restore fish and wildlife habitat and need for increased incidental recreation, water supply, and hydropower.

The American River watershed covers approximately 2,100 square miles northeast of Sacramento and includes portions of Placer, El Dorado, and Sacramento Counties. The city of Sacramento is located where the American River converges with the Sacramento River. Basin runoff is controlled by Folsom Dam and Reservoir as well as additional upstream resevoirs. The Lower American River conveys flows downstream of the dam through the Sacramento metropolitan area and into the Sacramento River. These flows are controlled by high ground in a portion of the American River and by an extensive system of levees extending along both banks of the American and Sacramento Rivers and their tributaries in the region. During very high flows in both the American and Sacramento Rivers, water is diverted into the Yolo Bypass via the Sacramento weir and bypass channel.

Folsom Dam and Reservoir, located on the main stem of the American River approximately 29 miles upstream from the city of Sacramento, is a multipurpose dam operated by the Bureau as part of the Central Valley Project. The maximum sustained flood control release that can be safely conveyed by the downstream channel is 115,000 cubic feet per second (cfs). This flow constitutes the “objective release” for flood management and planning purposes. As much as 160,000 cfs may be safely conveyed on a limited, emergency basis. This flow constitutes the “emergency spillway release”. The flood problem is that the flood control system protecting the city of Sacramento does not provide an adequate level of flood protection for such an extensive, highly urbanized area. The system does not meet the community goal, as adopted by SAFCA and the Reclamation Board, of achieving at least a 200-year level of flood protection (lowering the flood risk to an annual exceedance probability of 1-in-200 or less).

Currently, Folsom Dam and the downstream levee system provide the city of Sacramento with protection against floods with 1-in-85 chance of occurrence in any year. In accordance with provisions of the Water Resources Development Act (WRDA) of 1996 and WRDA of 1999, the

American River Common Features Project currently under construction will raise and strengthen levees to reduce the risk of flooding from a 1-in-85 chance to a 1-in-100 chance in any year. Construction of this project is scheduled for completion in 2003. The Folsom Dam Modification Project, which was authorized in the 1999 WRDA and is scheduled for completion in 2008, will modify Folsom Dam's outlet works and improve the dam's and surcharge storage capability. After the Common Features and Folsom Modification Projects are completed, the operators of Folsom Dam will be able to evacuate flood storage space earlier in a storm event and safely store more water behind the dam. In addition, the American River levee system will be able to reliably pass the emergency spillway release. These improvements will further reduce the risk of flooding to a 1-in-140 chance in any year. Finally, as directed by Congress in the 1999 WRDA, the Folsom Dam Flood Management Plan will be updated to gain additional flood storage space through advance release of stored water based on forecast inflow of large storms. Although the details of this advance release operation have not been developed, preliminary evaluations performed in connection with this long-term study indicate that advance release may further reduce the overall risk of flooding to approximately a 1-in-164 chance in any year.

Even with all of the above-described improvements in place, the Corps and Bureau have determined that Folsom Dam will not meet current Federal dam safety standards which require all Federal dams to be capable of passing the Probable Maximum Flood (PMF) without failure. The PMF is a combination of the most extreme hydrologic events that can occur on a watershed. The Corps is responsible for developing a plan to correct this dam safety deficiency; the Bureau is responsible for implementing the plan. The least cost dam safety solution developed by the Corps includes lowering the Folsom Dam spillway 6 feet and constructing a 3.5-foot parapet wall on all dams and dikes. Significant work at Folsom Dam can be avoided by modifying the spillway at L. L. Anderson Dam, which is owned by Placer County Water Agency and controls French Meadows Reservoir located on the Middle Fork of the American River. Due to inadequate spillway capacity, L. L. Anderson Dam is expected to fail in the PMF thus contributing additional inflow to Folsom Dam. This spillway deficiency may be corrected though state of California dam safety regulations or through Federal Energy Regulatory Commission (FERC) licensing. This work, however, is not funded or scheduled. Therefore, existing conditions include inadequate dam safety as well as an unacceptably low level of flood protection. The future without-project condition is that this least cost dam safety fix will be implemented. Because the funding for dam safety is constrained, the time frame for implementation is uncertain. Accordingly, to ensure the completeness of the Folsom Dam enlargement alternatives, these alternatives include measures to correct the PMF deficiency.

The Lower American River floodway between Folsom Dam and the Sacramento River is highly valued open space that provides wildlife habitat, outdoor recreation, and environmental value in the middle of a metropolitan area. Ecological problems exist in the Lower American River caused primarily by dam and levee construction, historic dredger mining activities, and development in the river's flood plain. The problems include the loss of fish spawning habitat instream, the regional loss of wetland and riparian habitats, and the lack of terrace flooding. Recent studies carried out in connection with the development of a multi-objective management plan for the Lower American River have identified numerous opportunities for improving and restoring ecosystem values in this corridor.

S.1.3 Statement of Purpose and Need

The purpose of the American River Watershed Long-Term Study is to plan, design, and implement a flood damage reduction project that would increase the level of flood protection provided to the Sacramento area along the main stem of the American River. The objective of the Corps is to provide increased flood damage reduction consistent with Federal planning principles and guidelines. The objective of the Reclamation Board and SAFCA is to provide a high level of protection appropriate for a large metropolitan area by lowering the flood risk to an annual exceedance probability of 1-in-200 or less. In addition to flood damage reduction, a purpose of the study is to restore degraded habitat conditions in the Lower American River through ecosystem restoration.

The need for increased flood protection was shown in major storm events in both February 1986 and January 1997 that resulted in extreme floodflows in the American River watershed. In February 1986, high flows in the Sacramento River combined with increased outflows from Folsom Dam caused the river to rise above the design freeboard of levees protecting the city of Sacramento, and emergency repair work was necessary for localized areas. The storm events of January 1997 created the largest precipitation peaks ever recorded at stream gaging stations on the Sacramento and American Rivers. These events raised significant concern over the adequacy of the existing flood control system, which has led to a series of investigations addressing the need for improved flood protection for Sacramento area.

S.1.4 Primary Objectives

The following flood protection and ecosystem restoration objectives were determined by the Corps, Reclamation Board, SAFCA, and others through an iterative planning process and then used to formulate alternative plans:

- Reduce flood damages in the Sacramento urban area from overflows of the American River. In this regard, the non-Federal sponsors' objective is a high level of flood protection appropriate for the catastrophic nature of American River flooding.

- Restore plant, fish, and wildlife habitat and other environmental resources in the American River watershed.

- Develop an implementable plan that will receive consensus among the various flood control agencies, environmental agencies, Federal government, and the local community.

S.2 Major Conclusions

S.2.1 Basis for Alternative Analysis and Plan Formulation

A full array of flood control measures was developed and tested in previous studies. These are summarized in this report.

The 1991 Feasibility Report and the 1996 SIR identified upstream detention in the vicinity of the city of Auburn on the North Fork of the American River as the National Economic Development (NED) Plan. The NED Plan maximizes economic benefits over costs. Detention dam plans to increase flood storage were thoroughly studied in both reports. As a basic flood control measure, upstream detention is still feasible and considered the most efficient and generally the most effective means of controlling flooding on the American River. The 1991 Feasibility Report formulated a 483-foot-high roller-compacted concrete gravity dam with a capacity of 545,000 acre-feet as part of the "200-Year" plan. This long-term study updated the costs, benefits, and accomplishments of this measure. The net benefits of this measure are higher than those of any other flood damage reduction measure; thus, this plan is the most efficient plan for flood control and is the NED Plan.

This long-term study is supplemental to the 1991 feasibility study and the 1996 SIR. These previous efforts developed and analyzed a full range of flood control alternatives for the Sacramento area. The basic findings of these previous efforts remain valid. Elements of the plans developed in the previous studies have been authorized for construction. These include the Natomas Federal Project, Folsom Modification Project, and the Common Features Project.

S.2.2 Long-Term Study Flood Damage Reduction Alternatives

As specified in Section 566 of WRDA of 1999, additional flood control plan formulation for this study is limited to measures derived from two basic alternatives: downstream levee modification and Folsom Dam enlargement. Folsom enlargement (physical raise to Folsom Dam) is the only means to increase flood control surcharge storage. Through the public scoping process, a third basic measure—maximum advance release from Folsom Dam in addition to without-project advance release—was added. This was found not to be a viable alternative because without-project advance release will already have taken full advantage of Folsom Dam's advance release capability.

Eight flood damage reduction alternatives were evaluated for the long-term study. One is no action, three are different sized Folsom enlargement alternatives, three are different downstream levee configurations, and one is a combination plan. The alternatives are summarized below.

S.2.3 Description of Flood Control Plan Alternatives

This long-term study evaluates the plan components, accomplishments, design, operations, and environmental effects of eight candidate plan alternatives.

Alternative 1: No Action

The No-Action Alternative is representative of without-project future conditions and serves as the baseline against which the costs, benefits, and effects of the plans under evaluation in this analysis are measured. Under this alternative, no action would be taken to implement a specific plan to increase flood protection along the American River beyond that which is already authorized.

The flood risk to Sacramento would be lowered to a 1-in-140 chance in any year after the Folsom Modifications Project is in place. The update to the Folsom Flood Management Plan would institute advance release. This could further lower the flood risk to Sacramento to possibly a 1-in-164 chance in any year.

With outlet modifications and surcharge storage in place, Folsom Dam will be able to pass only approximately 70 percent of the PMF. Folsom Dam safety would continue to be a problem for the near term. Because Folsom Dam is a major dam upstream of a heavily populated area, it would be altered to contain 100 percent of the PMF. This work, however, is unscheduled.

Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation

Alternative 2 increases flood control protection by raising the height of Folsom Dam by 3½ feet, thereby enlarging the flood space available in Folsom Reservoir from an elevation of 474 to 478 feet above mean sea level (msl). In addition, the spillway would be lowered 6 feet, from 418 feet in elevation to 412 feet in elevation. This combined with the raise would allow Folsom Dam to pass 100 percent of the PMF. The raise would increase the reservoir's storage capacity by 47,000 acre-feet and create 5 feet of freeboard to protect the dam from wind and wave runup.

Implementation of this alternative would involve the following components:

Replacement of Existing Spillway Gates. All eight spillway gates at Folsom Dam would be replaced with larger gates under this plan.

Modification of Spillway and Bridge Piers. The spillway would be lowered 6 feet. Spillway bridge piers would be raised and extended downstream to anchor the new larger radial spillway gates. The piers would be further strengthened through the installation of post-tension tendons to anchor the piers to the concrete of the dam's overflow section.

Replacement of Spillway Bridge. The existing eight-span spillway bridge would require replacement because of the higher flood control pool and spillway gates. The new bridge would be approximately 400 feet long and 35 feet wide with one through traffic lane in each direction.

Raising of the Concrete Dam. The concrete portions of Folsom Dam outside of the spillway area would be raised by construction of a parapet wall.

Construction of a Concrete Wall on Dams and Dikes. A 3½-foot-high concrete wall would be constructed on top of the left and right embankment wing dams beyond the center concrete section and on the top of the dikes around the perimeter of the reservoir.

Modification of the Elevator Tower. Components of the elevator at Folsom Dam would be modified and relocated to accommodate the raise of the existing structure.

Borrow Extraction and Hauling. Borrow for embankment materials would be excavated from the peninsula site, located between the North and South Forks of the American River at Folsom Lake. Peninsula materials will be barged across Folsom Lake.

Location of Construction Staging Areas. Construction staging areas would be located immediately adjacent to the landside of the existing embankment dams and dikes. These locations were selected based on existing topography and environmental conditions to minimize environmental effects.

Construction of Temporary Construction Bridge. A temporary construction bridge approximately ¼ mile in length would be constructed downstream of the left wing dam. This bridge would be aligned to provide a detour route across the American River while the spillway bridge would be unavailable for public use during construction. The temporary construction bridge would be dismantled after completion of the dam raise, and traffic would revert to the new spillway bridge over Folsom Dam, at the discretion of the Bureau.

Mooney Ridge. The increased flood pool elevation associated with this alternative could temporarily inundate the lower portions of backyard areas of six residences on Mooney Ridge in Granite Bay. The solution to this issue would be the acquisition of flood easements up to the top of the new flood control pool at the 478-foot elevation. Depending on consultation with property owners, possible alternatives include construction of a retaining wall and infill of back yards, and construction of a dike on project lands.

Additional Structural Work. Additional structural work associated with the dam raise would include the removal, enlargement, and replacement of the gantry crane at the top of the spillway bridge and the relocation and modification of the penstock wheel gates, inlet temperature shutters, and the hydraulic power units and controls.

Widen L. L. Anderson Dam Spillway. L. L. Anderson Dam (French Meadows Reservoir) spillway would be widened so that the dam would safely pass the PMF. This will lower PMF inflows to Folsom Dam.

Real Estate Requirements. Additional lands would be acquired at a few locations where the enlarged flood pool would extend beyond the Federal project boundary. Lands would be needed for borrow and environmental mitigation.

Implementation of the 478-foot maximum flood pool elevation raise would remedy Folsom Dam's existing safety deficiency and would reduce the probability of flooding in Sacramento from a 1-in-164 chance to a 1-in-189 chance in any year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. For economic evaluation, costs allocable to dam safety were subtracted from the project cost. Costs for dam safety were identified using the separable cost remaining benefit (SCRB) method typically used to allocate costs for multipurpose water resources projects. This alternative is economically justified and fully supportable from a Federal perspective.

Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Implementation of Alternative 3 would increase flood control protection and remedy Folsom Dam's spillway deficiency by raising the height of the dam by 7 feet. The raise would be a combination of raising the concrete monolith and embankments and adding a 3½-foot parapet wall. In addition, the L. L. Anderson Dam spillway would be widened to lower PMF inflows to Folsom Dam. The raise would accommodate the resulting PMF water surface of 484 feet with 3½ feet of freeboard. The top-of-flood-pool elevation would rise from an elevation of 474 to 482 feet above msl. The top-of-flood-pool elevation is limited to 482 feet because this is the maximum normal operation that meets dam stability criteria. This would increase the reservoir storage capacity by 95,000 acre-feet.

The plan components for Alternative 3 are essentially identical to those of Alternative 2 with the exception that the spillway would not be lowered and in addition to the 3½-foot concrete wall, wing dams, dikes, and Mormon Island Dam embankments would be raised using fill material. With the additional borrow requirement a second borrow site, located at Mississippi Bar on the west side of Lake Natoma, would be used. Material from Mississippi Bar would be barged across Lake Natoma to Willow Creek and trucked on local roads to the project sites. In addition, an approximately 1/3-mile section of Folsom Dam Road southeast of the left wing dam would be raised in place to an elevation above 482 feet to avoid inundation while Folsom Dam is under flood operations.

Implementation of the 482-foot maximum flood pool elevation raise would remedy Folsom Dam's safety deficiency and would reduce the probability of flooding in Sacramento from a 1-in-164 chance to a 1-in-213 chance in any year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is economically justified and fully supportable from a Federal perspective.

Alternative 4: Twelve-Foot Dam Raise/487-Foot Flood Pool Elevation

Implementation of Alternative 4 would increase flood control protection by raising the height of Folsom Dam by 12 feet, thereby enlarging the flood space available in Folsom Reservoir from an elevation of 474 to 487 feet above msl. This would increase the reservoir storage capacity by 157,000 acre-feet and provide 5 feet of freeboard to protect the dam from wind and wave runup.

This plan was developed to represent the maximum feasible dam raise possible without extensive modifications to the structure, including foundation work, that would require dewatering the reservoir.

Preliminary stability analysis indicates that a flood pool elevation greater than 482 feet would violate factors of safety designed to prevent the dam from overturning. To prevent this from happening, additional structural work would be required on the downstream face and possibly in the concrete dam.

Implementation of the 487-foot maximum flood pool elevation raise would solve Folsom Dam's existing spillway deficiency and would reduce the probability of flooding in Sacramento from a 1-in-164 chance to a 1-in-233 chance in any year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is economically justified and partially supportable from a Federal perspective. The difference in cost between this alternative and Alternative 3 would be borne entirely by the non-Federal sponsors.

Alternative 5: Stepped Release to 160,000 cfs

Alternative 5 consists of increasing the objective release from Folsom Dam from 115,000 cfs to 145,000 cfs and then stepping flow incrementally to 160,000 cfs depending on the severity of the storm and its effect on storage in Folsom Reservoir. This plan does not include dam safety improvements since no major modifications to Folsom Dam are involved.

Implementation of this alternative would involve the following components:

Strengthening of Existing Levees along the Lower American River. A 7-foot-high stability berm accompanied by lengthening of the levee slope would be constructed from the Sacramento River to the Natomas East Main Drainage Canal. In addition, erosion protection on approximately 6 miles of levee slope would be accomplished so that the levees would withstand higher flows and increased velocity.

Modification of Local Drainage Facilities. Higher water surface elevations caused by increased releases could adversely affect the operation of numerous pumping and drainage facilities throughout the city and county of Sacramento. Most of these facilities have been identified and evaluated for the extent to which modifications would be required. Potential modifications include raising discharge inverts, installing higher capacity pumps and motors, and constructing two new pump stations with new discharge lines.

Modification of Water Intake Facilities. Several water intake facilities along the Lower American River would be strengthened and armored to mitigate the potential for scour damage that would result from increased floodflows.

Relocation of Utilities along the Lower American River. In addition to bridges, drainage facilities, and water intake facilities, a number of other facilities would require modification or relocation. These include recreation facilities, pipelines, roads, bike trails, utilities, fences, and signs.

Location of Borrow Sites and Construction Staging Areas. Borrow areas include the Port of Sacramento dredge tailing disposal areas, dredge disposal areas in the Sacramento-San Joaquin River Delta, and the abandoned Sacramento Bypass north levee. Staging areas would be located to minimize environmental impacts.

Modification of the Sacramento Weir and Bypass. To ensure that the higher flows from the American River flow into the Yolo Bypass instead of the Sacramento River, the Sacramento

Weir and Bypass would be lengthened and widened 1,000 feet. This would include construction of a new levee on the north bank of the bypass.

Raising and Strengthening of Levees in the Yolo Bypass, Sacramento River, and Sloughs. Levees associated with the Yolo Bypass and other tributary sloughs would be strengthened by construction of slurry walls and stability berms and replacement of levee material with a soil/lime mixture to solidify the levee. These modifications would ensure that the project would not result in an increased risk of flooding to areas protected by the Sacramento River, Yolo Bypass, and associated sloughs.

Alternative 5 places a greater emphasis on reducing flood risk by strengthening levees and relying on more frequent high flows in the channel. Accordingly, although the risk of levee failure is reduced, the initial effects, if levee failure were to occur, would be substantial. Implementation of this project alternative would reduce the probability of flooding in Sacramento from a 1-in-164 chance to a 1-in-172 chance in any year (with moderate advance release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is not economically feasible; thus, there is no Federal interest in this plan.

Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam

Alternative 6 is designed to augment features associated with Alternative 5 with the addition of a new outlet at Folsom Dam. The new outlet would be added to the dam to increase the early release capacity from 115,000 cfs to 145,000 cfs. After the 145,000-cfs objective release is met, the release would step up to 160,000 cfs in a manner similar to that under Alternative 5. The higher early release would result in conservation of flood storage during flood events.

Implementation of this alternative would reduce the probability of flooding in Sacramento from a 1-in-164 chance to a 1-in-185 chance in any year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is not economically justified; thus, there is no Federal interest in this plan.

Alternative 7: Stepped Release to 180,000 cfs

Similar to the previous two alternatives, this alternative would increase the objective release from Folsom Dam from 115,000 cfs to 145,000 cfs. Under Alternative 7, flows are stepped incrementally to a higher emergency flow of 180,000 cfs.

Implementation of this alternative would involve the same work described under Alternative 5 plus extensive additional work along the Lower American River to accommodate the 180,000-cfs flow. The following components are included:

TABLE S-1. Summary of Benefits and Costs of Plan Alternatives [a] (Reported in Million $)

Alternative	Expected Annual Probability of Exceedance (1-in-X Chance per Year)		Total First Cost	Annual Cost [a]	Expected Average Annual Benefits			
					No Advance Release		Moderate Advance Release	
	No Advance Release	Moderate Advance Release			Annual Benefits [b]	Net Benefits	Annual Benefits [b]	Net Benefits
Alternative 1: No Action	0.0071 (140)	0.0061 (164)	NA	NA	NA	0	NA	0
Alternative 2: 3.5-Foot Dam Raise/478-Foot Flood Pool Elevation	0.0065 (154)	0.0053 (189)	176.1	5.1	12.4	7.3	12.2	7.1
Alternative 3: Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	0.0057 (175)	0.0047 (213)	179.2	6.6	20.5	13.9	18.9	12.3
Alternative 4: Twelve-Foot Raise/487-Foot Flood Pool Elevation	0.0051 (196)	0.0043 (233)	314.8	16.2	27.5	11.3	23.0	6.8
Alternative 5: Stepped Release to 160,000 cfs	0.0067 (149)	0.0058 (172)	174.7	14.0	8.1	-5.9	5.7	-8.3
Alternative 6: Stepped Release to 160,000 cfs and New Outlet at Folsom Dam	0.0063 (159)	0.0054 (185)	199.7	16.0	11.6	-4.4	8.6	-7.4
Alternative 7: Stepped Release to 180,000 cfs	0.006 (167)	0.0051 (196)	191.8	15.4	15.4	0.0	11.8	-3.6
Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation	0.0051 (196)	0.0045 (222)	337.4	18.3	29.3	11.0 [c]	23.2	4.9 [c]

[a] Annual costs for Alternatives 2, 3, 4, and 8 reflect costs attributable to flood control only (dam safety costs subtracted out).

[b] Annual benefits for the dam raise alternatives include $0.2 million for advance replacement of Folsom Dam spillway bridge

[c] Although the total net benefits are positive, the alternative is not incrementally feasible. That is, the first increment would be the dam raise, the second increment, the stepped release to 160,000 cfs, since it of itself has negative net benefits, it is not incrementally justified.

Raising and Strengthening of Existing Levees along the Lower American River. Approximately 13.5 miles of Federal and non-Federal levees along the north and south banks of the American River would be raised by an average of 2 feet to accommodate the desired rate of objective release. Approximately 1 mile of levee would be strengthened through construction of a slurry wall.

Construction of New Levees and Floodwalls along the Lower American River. Approximately 2 miles of new levees and 1.7 miles of floodwalls would be constructed to protect flood-prone areas from an objective release of 180,000 cfs.

Modification of Bridges along the Lower American River. Flows up to 180,000 cfs in the American River channel would be accommodated by raising the height of the Howe Avenue and Guy West Bridges between 3 and 5 feet and by modifying the Union Pacific Railroad (UPRR) trestle.

Alternative 7 places a greater emphasis on reducing flood risk by raising the height of levees. Accordingly, although the risk of levee failure is reduced, the initial effects, if levee failure were to occur, would be substantial. Implementation of this alternative would reduce the probability of flooding in Sacramento from a 1-in-164 chance to a 1-in-196 chance in any year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is not economically justified; thus, there is no Federal interest in this plan.

Alternative 8: Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation

Alternative 8 provides a high level of flood protection by combining all the features associated with the 160,000-cfs stepped release alternative (Alternative 5) with those of the seven-foot dam raise/482-foot flood pool elevation (Alternative 3).

Implementation of this alternative would reduce the probability of flooding in Sacramento from a 1-in-164 chance to a 1-in-222 chance in any year (with moderate advanced release).

Probable exceedance, costs, and benefits are shown in Table S-1. This alternative is not economically justified if advance release is part of the without-project condition. Current analysis shows that if there were no advance release, this alternative would be marginally feasible. As the dam raise would be a separable first increment, the addition of the stepped release as a second increment would not be economically justified. Thus, there is no Federal interest in this plan.

S.2.4 Description of Ecosystem Restoration Plan Alternatives

This long-term study evaluates the plan components, accomplishments, design, operations, and environmental effects of the following five-candidate ecosystem restoration plan alternatives.

Alternative 9: Urrutia Restoration Site

The Urrutia site consists of 251 acres on the north bank of the Lower American River, between river mile (RM) 1 and RM 2, and is composed of an existing surface mining site mostly devoid of native vegetation. The conceptual restoration plan includes the eradication of nonnative invasive plant species; terracing of existing steep banks; grading to appropriate flood plain elevations; and planting reconstructed areas with seasonal wetland and riparian forest plant species.

Alternative 10: Woodlake Restoration Site

The Woodlake site adjoins the upstream end of the Urrutia site and consists of 283 acres of open space located between RM 2 and RM 4. Existing site conditions generally are characterized by an unusually high flood plain that infrequently receives overbank flows. The conceptual restoration plan includes the eradication of nonnative invasive plant species; restoration of the connectivity between the river and the flood plain terrace; seeding to reestablish native grasslands; and grading to appropriate flood plain elevations and planting reconstructed areas with riparian forest oak woodland, and oak savanna plant species.

Alternative 11: Bushy Lake Restoration Site

The 347-acre Bushy Lake site is upstream from Woodlake, between RM 4 and RM 5.5. Two urban streams covey urban stormwater runoff into Bushy Lake with those flows then entering into the Lower American River. The conceptual restoration plan includes the eradication of nonnative invasive plant species combined with the construction of ephemeral side channels planted with emergent wetland plant species and the installation of a pump and delivery system to carry water to Bushy Lake. Further ecosystem restoration includes the creation of an ephemeral channel from the lake to convey high flows to the river; terracing steep banks; and planting riparian forest, oak woodland, and oak savanna plant species on newly graded site areas.

Alternative 12: Arden Bar Restoration Site

The Arden Bar site consists of 280 acres located on the north bank, between RM 12 and RM 13, that support a 33-acre training facility used by the county sheriff's department, a 45-acre developed park site, and a 34-acre fishing pond. The conceptual restoration plan for this site includes the eradication of nonnative plant species and the reestablishment of wetland, riparian, and oak savanna plant communities. The design elements include the construction of low-level bank benches, a high-flow bypass channel, and lentic habitat at the bypass channel outlet.

Alternative 13: Folsom Dam Temperature Shutter Mechanization

The construction of Folsom Dam artificially restricted salmon and steelhead life cycles to the 23-mile Lower American River, and recent biological monitoring indicates that water temperatures in the Lower American River have tended to exceed the temperature regime necessary to sustain existing spawning and rearing salmon and steelhead populations. Maintenance of optimal water temperatures for spawning and rearing depends on the dam's

ability to deliver coldwater releases to the Lower American River at critical times of the year. Limiting factors include the actual volume of the coldwater pool behind the dam during the warmer summer and fall seasons when coldwater demand is highest combined with the structural features of the dam that provide physical access and release of this coldwater from the reservoir to the Lower American River when needed to provide suitable aquatic habitat for downstream fisheries.

Virtually all the water released is through the dam's three hydropower penstock intakes. Intake shutters control the elevation and thus the temperature of the water drawn from the reservoir and released to the Lower American River. Currently, the temperature shutters are manually adjusted because of the structural features of the penstocks. This manual operation does not allow for the flexibility and timeliness needed to optimize management of the coldwater pool. An alternatives analysis determined that automation of the temperature shutters would solve the existing ecosystem problem by increasing the physical and operational capability of the penstocks, thereby optimizing the management of the coldwater pool and the greatest operational flexibility and responsiveness year round.

S.2.4 Environmentally Preferable Alternative/Environmentally Superior Alternative

NEPA requires the identification of the environmentally preferable alternative, and CEQA requires the identification of the environmentally superior alternative. Both alternatives represent the plan that causes the least damage to the biological and physical environment and best protects natural and cultural resources while accomplishing project objectives. The environmentally preferable/superior alternatives will be identified in the final report. Tentatively, the dam raise alternatives (Alternatives 2, 3, and 4) better meet the definition of these alternatives than do the other alternatives.

S.3 Unresolved Issues

Following review of this draft report, the Reclamation Board and SAFCA will identify the locally preferred plan to guide preparation of the final report.

S.3.1 L. L. Anderson Dam Safety

The analysis of the PMF shows that L. L. Anderson Dam, which impounds French Meadows Reservoir, will overtop and result in dam failure. This failure will increase the PMF inflow to Folsom Dam by 100,000 cfs. L. L. Anderson Dam is operated by Placer County Water Agency for water and power. Modification of this dam is the least costly means of controlling the increased PMF inflow to Folsom Dam that is likely to occur under existing conditions. Therefore, all the Folsom Dam enlargement alternatives include modifications to L. L. Anderson Dam.

The French Meadows project will be up for relicensing by FERC in 2013. At that time, if it is still determined that the dam cannot pass the PMF without overtopping and failure, it is likely that FERC will require that modifications be made to ensure that the project can pass the PMF. In addition, the dam is under the jurisdiction of the State of California through the Division Safety of Dams (DSOD). DSOD also would likely require that modifications be made.

Because FERC and DSOD are still reviewing the Corps' PMF estimate and have not yet reviewed dam safety at French Meadows, it is unknown what modifications that they may require. Accordingly, in order to ensure the completeness of the Folsom Dam enlargement alternatives, the Corps has identified modifications to L. L. Anderson Dam for inclusion in each of these alternatives. If similar modifications are required by FERC or DSOD within a reasonable period of time, they would become part of the without-project condition, and the dam raise alternatives would be revised.

S.4 Issues of Known Controversy

S.4.1 Traffic Impacts

The Bureau has allowed public use of the bridge over Folsom Dam spillway for many years, even though the dam road was never intended to be a public thoroughfare. It is used by upwards of 16,000 vehicles per day. Because of the growth of the region, the City of Folsom and El Dorado and Placer County communities have come to rely on this crossing of the American River.

Even though the public does not have a legal right to use the road, the Folsom enlargement plans all include a temporary construction bridge to offset the significant adverse impacts that would result from closing the road during the extensive construction period. After construction is complete, the temporary construction bridge would be dismantled and the road across the dam would be available for the public's use again at the discretion of the Bureau.

There is local interest and Bureau interest in constructing a permanent bridge that would allow existing traffic to be diverted off the dam road, thus lessening security problems and avoiding maintenance conflicts associated with public access to the spillway portion of the dam. Congress could separately authorize such a bridge or include it as part of an authorized dam raise project, thereby committing the Federal Government to fund the difference in cost between the permanent bridge and the temporary construction bridge. Alternatively, the upgrade could occur as a result of a local initiative with local funding for the cost difference.

S.4.2 Water Supply

All the Folsom enlargement alternatives expand the flood control space but do not create additional water supply space. This is in conformance to this study's authorization, in which Congress stipulated that the Corps study enlargement for flood control only.

S.5 Relationship to Environmental Protection Statutes, Plans, and Other Requirements

This report has been prepared in accordance with the requirements of NEPA, CEQA, and other pertinent Federal, State, and local environmental regulations. NEPA requires that the environmental consequences of a proposed action and project alternatives be considered before decision making for implementation of a Federal project. CEQA requires that environmental consequences of a proposed action and project alternatives be considered before the approval, financing, or participation by the State of California. Chapter 9.0, "Cumulative and Growth-Inducing Effects and Other Required Disclosures," presents the applicable environmental laws

and regulations and plans being considered as part of the analysis of flood protection alternatives. Documentation is included to demonstrate that the candidate plans are in compliance with Section 404(b)(1) guidelines. A Section 404(b)(1) analysis is included for each candidate plan in Appendix 1(D). This document meets the exemption criteria of Section 404(r) of the Clean Water Act.

S.6 Summary of Benefits and Costs of the Proposed Action

Table S-1 shows a comparison of total investment costs, annual costs, and expected benefits under each project alternative. Alternative 2 (3.5-Foot Dam Raise/478-Foot Flood Pool Elevation), Alternative 3 (Seven-Foot Dam Raise/482-Foot Flood Pool Elevation), and Alternative 4 (12-Foot Dam Raise/487-Foot Flood Pool Elevation) have benefits greater than costs. Thus, they are economically feasible and warrant Federal participation. Alternative 8 (Stepped Release to 160,000 cfs and Seven-Foot Dam Raise/482-Foot Flood Pool Elevation) produces benefits greater than costs, but the downstream levee modifications are an uneconomic increment to Folsom Enlargement. Thus, the other alternatives (except Alternative 1, No Action) have greater costs than benefits, are economically infeasible, and have no Federal interest. These alternatives could still be implemented by local interests.

S.7 Summary of Potential Environmental Effects and Proposed Mitigation

A detailed discussion of potential project-related effects and mitigation is provided in Chapter 7.0, "Environmental Effects and Mitigation." A summary of effects, mitigation measures, and mitigation level of significance after mitigation for the flood control alternatives and ecosystem restoration alternatives is provided in Table S-2 and S-3, respectively.

S.8 Federally Supportable Plans

The authorizing language of Section 566 of WRDA of 1999 specifically directs the study to assess flood control through "increasing surcharge flood control storage at the Folsom Dam and Reservoir" and, in a separate subsection, through "levee modification." Thus, all Folsom Dam enlargement alternatives are compared to identify the one enlargement alternative that best meets planning objectives and has the highest net benefits (benefits minus costs). This is the Federally supportable Folsom enlargement plan. Similarly, all stepped release plans are compared to identify the Federally supportable downstream levee plan. The Federally supportable Folsom enlargement plan may be used as a basis for cost sharing a locally preferred plan involving enlarging Folsom Dam. Similarly, the Federally supportable downstream levee plan is the basis for cost sharing stepped release alternatives.

Alternative 3 is the Federally supportable Folsom enlargement plan because it has the largest net benefit of the enlargement set of plans. Because this alternative includes measures to correct the existing dam safety concerns, the costs of the enlargement should be distributed among all project beneficiaries including existing water and power customers of the CVP. In addition to using a cost allocation procedure for developing project economic costs between new flood control and dam safety, the cost allocation procedure will also be used to determine cost sharing. The dam safety portion of the costs would be shared between the Federal government (Bureau) and current non-Federal users in accordance with their established procedures. The

costs attributable to the increased flood control facilities would be cost shared between the Federal government (Corps) and the non-Federal flood control sponsor as stipulated in WRDA of 1996, in this case 65 percent Federal and 35 percent non-Federal. The final costs will not be known until the Bureau has finished their analysis of required dam safety work and that actual cost is factored into the cost allocation procedures. This determination is expected to be made prior to the finalization of this report in early 2002.

Alternative 2 is a lesser plan than Alternative 3. Costs allocated to flood control would also be cost shared 65/35 percent, similar to the cost share arrangement described above. The incremental costs of Alternative 4 over the Alternative 3 costs would be the responsibility of the non-Federal sponsor.

Because there is no Federally supportable downstream levee modification plan, implementation of any of these alternatives would be a local responsibility.

S.8.1 NED Plan

The last reported NED Plan was the Detention Dam Plan in the 1996 SIR. The primary feature of this plan was an 894,000-acre-foot flood control–only reservoir and dam on the North Fork. Another major feature of this plan was levee work along the Lower American River, which is now being accomplished as part of the Common Features Project. With higher flood protection forthcoming via the Common Features Project and Folsom Modifications, a smaller upstream detention dam could be the NED Plan. The 545,000 acre-foot flood control dam was analyzed in the 1991 Feasibility Report. The updated first cost would be $788 million and the total annual cost allocable to flood control would be $51.4 million. Net flood control benefits, with advance release, would be $4.5 million. Since an upstream detention dam would reduce flood control storage requirements at Folsom Dam, this alternative would also generate water resource related benefits. The 1996 SIR estimated these additional benefits at approximately $12 million. Although this estimate has not been updated for the present study, the net benefits of an upstream detention dam (545,000 acre-feet) would likely exceed those for any other identified flood control plan. In that case, the upstream detention dam would remain the NED Plan. The actual size of the dam that would further maximize net benefits would need to be determined based on further studies.

S.8.2 NER Plan

The environmental restoration alternatives are the economically optimal (best buy) plans for each of the four environmental restoration sites (Urrutia, Woodlake, Arden Bar, and Bushy Lake) located in the Lower American River and for mechanizing the Folsom Dam temperature control shutters. This optimization was achieved by selecting the site plan that created the maximum Annual Average Habitat Units (AAHUs) per dollar spent. The NER Plan encompasses all of the environmental restoration alternatives as described in Chapter 6.0, “Ecosystem Restoration.” The total first cost of the NER Plan is $40.7 million, the total annual cost would be $3.5 million, and the benefits would be 1,065.4 AAHUs.

S.8.3 Optimum Trade-Off Plan

The optimum trade-off plan would be the NED Plan (likely an upstream detention dam providing approximately 545,000 acre-feet of storage) combined with the NER Plan. The NED and the NER Plans would be additive; that is, they could be combined with no effect on their individual features or benefits.

Similarly, Alternative 3, the Federally supportable Folsom enlargement plan, and the NER Plan are additive. This is less optimal than the NED/NER Plan because the net benefits are less. To determine cost sharing, the Federally supportable Folsom enlargement plan (Alternative3)/NER Plan is treated the same as if it were the NED/NER Plan.

S.8.4 Selected Plan

After public review of this draft report, the local sponsors will select their preferred plan. This preferred plan will be the basis for a plan to recommend for authorization. Changes will be made, if needed, to the preferred plan so that it conforms to Federal policy and guidance.

TABLE S-2. Summary of Effects and Mitigation Measures of Project Alternatives 1 through 8

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.1 Hydrology and Hydraulics				
Construction-related effects	NE	None Required	NE	All
Operation-related effects				
Change the conservation storage pool at Folsom Reservoir	B	None Required	B	1
Change the conservation storage pool at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Change flood protection downstream of Folsom Dam	B	None Required	B	All
Change flows in Yolo Bypass	LS	None Required	LS	5, 6, 7, 8
7.2 Geology, Seismicity, and Soils				
Construction-related effects				
Cause substantial soil erosion and/or the loss of topsoil	NE	None Required	NE	1
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the modification of the L. L. Anderson Dam spillway	S	**Mitigation Measure WQ-2:** Implement erosion control measures.	LS	2, 3, 4, 8
Increase seismic or geologic hazards at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure WQ-2:** Implement erosion control measures.	LS	2, 3, 4, 8
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures. **Mitigation Measure WQ-2:** Implement erosion control measures.	LS	5, 6, 7, 8
Increase seismic or geologic hazards along the Lower American River and the Yolo and Sacramento Bypasses	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Cause substantial soil erosion and/or the loss of topsoil	NE	None Required	NE	1

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.2 Geology, Seismicity, and Soils (Continued)				
Cause substantial soil erosion or mass movement in the inundation area at Folsom Reservoir as a result of flood control operations at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Decrease vertical and lateral channel stability in the Lower American River	LS	None Required	LS	5, 6, 7, 8
7.3 Water Supply				
Construction-related effects				
Adversely affect water storage at French Meadow Reservoir as a result of construction activities associated with modification of the L. L. Anderson Dam spillway	NE	None Required	NE	2, 3, 4, 8
Adversely affect water storage at Folsom Reservoir	NE	None Required	NE	5, 6, 7, 8
Adversely affect water supply conditions at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Adversely affect water supply conditions at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	LS	None Required	LS	6
Adversely affect water supply conditions along the Lower American River	NE	None Required	NE	2, 3, 4
Adversely affect water supply conditions along the Lower American River as a result of activities associated with the construction of flood control improvements along the Lower American River	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Affect water storage at Folsom Reservoir	B	N/A	B	1
	LS	None Required	LS	2, 3, 4, 5, 7, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.3 Water Supply (Continued)				
Adversely affect water supply conditions along the Lower American River as a result of increasing objective releases from Folsom Dam	LS	None Required	LS	5, 6, 7, 8
7.4 Hydropower				
Construction-related effects				
Reduce hydropower production at Folsom Dam	NE	None Required	NE	1
Affect hydropower production as a result of construction activities associated with the modification of the L.L. Anderson Dam spillway.	NE	None Required	NE	2, 3, 4, 8
Affect hydropower production at Folsom Dam Powerhouse as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	NE	None Required	NE	2, 3, 4, 8
Adversely affect hydropower production at Folsom Dam as a result of activities associated with the construction of a new outlet at the dam	LS	None Required	LS	6
Operation-related effects				
Hydropower production at Folsom Dam as a result of increasing the potential for Folsom Reservoir to fill	B	N/A	B	1
Affect hydropower production at Folsom Dam as a result of increasing objective releases	NE	None Required	NE	5, 6, 7, 8
Affect hydropower production as a result of modifications made to the L. L. Anderson Dam spillway	NE	None Required	NE	2, 3, 4, 8
Affect hydropower production at Newcastle Powerhouse	LS	None Required	LS	2, 3, 4, 8
7.5 Land Use and Socioeconomics				
Construction-related effects				
Change or conflict with land use around Folsom Reservoir, along the Lower American River, or within the Yolo and Sacramento Bypasses	NE	None Required	NE	1

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.5 Land Use and Socioeconomics (Continued)				
Change or conflict with land use at French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	NE	None Required	NE	2, 3, 4, 8
Change or conflict with land use at Folsom Reservoir as a result of activities associated with the modification of existing wing dams and dikes, the establishment of a borrow site near Peninsula campground, and the construction of temporary construction bridge below Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Change or conflict with land use at Folsom Reservoir	NE	None Required	NE	5, 7
Change or conflict with land use at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	NE	None Required	NE	6
Change or conflict with land use at Folsom Reservoir as a result of construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Create land use conflicts near Lake Natoma as a result of activities associated with the excavation and transport of borrow material from Mississippi Bar	LS	None Required	LS	3, 4, 8
Change or conflict with land use in and adjacent to the American River Parkway as a result of activities associated with the construction of stability berms along existing levees, the modification of existing drainage and pumping facilities, and the relocation of existing utilities along the Lower American River	LS	None Required	LS	5, 6, 7, 8
Change or conflict with land use within the American River Parkway as a result of activities associated with the improvement of existing levees, floodwalls, and bridges; the construction of new levees and floodwalls along the Lower American River; the modifications of bridges; and the use of staging areas from Nimbus Dam to Discovery Park	LS	None Required	LS	7
Conversion of prime farmland to non-agricultural uses in Yolo, Sacramento, and Solano Counties as a result of increasing the size of the Sacramento Bypass and strengthening levees in the Yolo Bypass and the Delta	LS	None Required	LS	5, 6, 7, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.5 Land Use and Socioeconomics (Continued)				
Reduce agricultural production as a result of increasing the size of the Sacramento Bypass and strengthening levees in the Yolo Bypass and the Delta	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Change or conflict with land use at Folsom Reservoir	NE	None Required	NE	1, 2, 3, 5, 6, 7, 8,
	LS	None Required	LS	4
Change or conflict with land use along the Lower American River	NE	None Required	NE	All
Change or conflict with land use within the Yolo and Sacramento Bypasses	NE	None Required	NE	All
7.6 Recreation				
Construction-related effects				
Disrupt recreation activities	NE	None Required	NE	1
Disrupt recreation activities at French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities on a segment of the American River Bike Trail located between Negro Bar and Beaus Point as a result of activities associated with the construction of temporary access roads and bridges	S	**Mitigation Measure R-1:** Provide notification of trail and road closures and establish alternative access routes. **Mitigation Measure R-2:** Ensure the segment of the American River Bike Trail between Beaus Point and Negro Bar is reestablished	LS	2, 3, 4, 8
Disrupt water-dependent recreation at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Dam	NE	None Required	NE	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.6 Recreation (Continued)				
Disrupt recreation activities near Mormon Island Dam, Dike 7, and Dike 8 as a result of activities associated with the construction of flood control improvements at Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities near Peninsula Campground as a result of activities associated with the construction of flood control improvements at Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities between Beals Point and Beaks Bight as a result of construction activities associated with increasing the height of dikes near the west shore of Folsom Reservoir	S	**Mitigation Measure R-3:** Provide notification of trail and road closures and establish alternative access routes.	S	2, 3, 4, 8
Disrupt recreation activities at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	NE	None Required	NE	6
Disrupt recreation activities on the American River Bike Trail or at Lake Natoma as a result of activities associated with excavating material from the Mississippi Bar borrow site	LS	None Required	LS	3, 4, 8
Disrupt recreation activities on the American River Bike Trail as a result of transporting borrow material from the Mississippi Bar borrow site to the barge loading site at Willow Creek, and from Willow Creek to Folsom Boulevard	S	**Mitigation Measure R-4:** Provide notification of trail closure, establish alternative trail routes, and signalize or flag intersection of the bike trail and haul road	LS	3, 4, 8
Disrupt recreation activities at Lake Natoma by temporarily converting the Willow Creek Recreation Area to a borrow material storage and transfer site	S	None Available	S	3, 4, 8
Disrupt recreation activities at Folsom Reservoir	NE	None Required	NE	5, 6, 7
Disrupt recreation activities on the American River Parkway trail system as a result of construction activities associated with the modification of existing drainage and pumping facilities along the Lower American River	S	**Mitigation Measure R-5:** Provide notification of trail and road closures and establish alternative access routes within the Parkway	LS	5, 6, 7, 8
Disrupt recreation activities in the Yolo and Sacramento Bypasses, Sacramento River and Delta Slough	LS	None Required	LS	5, 6, 7, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.6 Recreation (Continued)				
Disrupt recreation activities along the Lower American River as a result of activities associated with the construction of a floodwall near the Nimbus fish hatchery	S	**Mitigation Measure R-5:** Provide notification of trail and road closures and establish alternative access routes within the Parkway	LS	7
Reduce the number of available parking spaces at Goethe Park, Ancil Hoffman Park, Old Fair Oaks Bridge, and Nimbus Fish Hatchery during the construction of flood control improvements along the Lower American River	S	**Mitigation Measure R-6:** Provide notification of parking lot closures and identify alternative parking areas located nearest the affected area.	S	7
Operation-related effects				
Disrupt recreation activities at Folsom Reservoir	NE	None Required	NE	1, 5, 6, 7
	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities along the North and South Forks of the American River	NE	None Required	NE	1
	LS	None Required	LS	2, 3, 4, 8
Disrupt recreation activities along the Lower American River	NE	None Required	NE	1
	LS	None Required	LS	2, 3, 4, 5, 6, 7, 8
Disrupt recreation activities in the Yolo and Sacramento Bypasses	NE	None Required	NE	1
	LS	None Required	LS	2, 3, 4, 5, 6, 7, 8
7.7 Fisheries				
Construction-related effects				
Adversely affect fish habitat	NE	None Required	NE	1
Affect fish and fish habitat in the Middle Fork of the American River as a result of construction activities associated wit the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.7 Fisheries (Continued)				
Affect fish and fish habitat in Folsom Reservoir as a result of sediment, fuels, and lubricants being discharged during the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures. **Mitigation Measure WQ-2:** Implement erosion control measures.	LS	2, 3, 4, 8
Affect fish and fish habitat in Lake Natoma as a result of sediment, fuels, and lubricants being discharged during the operation of the Mississippi Bar borrow site	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	3, 4, 8
Affect fish and fish habitat downstream of Folsom Dam as a result of activities associated with the construction of a new outlet and modification of the spillway stilling basin	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	6
Affect fish and fish habitat in the Lower American River as a result of sediment, fuels, and lubricants being discharged into the river during the construction of flood control improvements along the Lower American River	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures. **Mitigation Measure WQ-2:** Implement erosion control measures.	LS	5, 6, 7, 8
Adversely affect fish habitat in the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta Sloughs as a result of sediment, fuels, and lubricants being discharged to surface waters during the construction of flood control improvements	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures. **Mitigation Measure WQ-2:** Implement erosion control measures.	LS	5, 6, 7, 8
Adversely affect fish habitat within the Sacramento and Yolo Bypasses as a result of the loss of vegetation caused by activities associated with the construction of flood control improvements adjacent to	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Affect fish habitat in the Lower American River	B	N/A	B	1
Affect fish and fish habitat in French Meadows Reservoir as a result of operating the L. L. Anderson Dam spillway	NE	None Required	NE	2, 3, 4, 8
Affect warm water and cold water fish at Folsom Reservoir as a result of flood control operations	LS	None Required	LS	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.7 Fisheries (Continued)				
Affect fish and fish habitat in the Lower American River as a result of flood control operations at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 5, 6, 7 8
Affect fish and fish habitat in the Yolo and Sacramento Bypasses as a result of increasing flood flows through the Yolo and Sacramento Bypasses	NE	None Required	NE	5, 6, 7, 8
7.8 Vegetation				
Construction-related effects				
Loss of vegetation at Folsom Reservoir, along the Lower American River, or in the Yolo and Sacramento Bypasses	NE	None Required	NE	1
Loss of vegetation in the vicinity of L.L Anderson Dam as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Loss of vegetation during construction of flood control at Folsom Dam as a result of activities	NE	None Required	NE	2, 3, 4, 8
Loss of common natural vegetation communities at Folsom Reservoir as a result of construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Loss of oak woodland and oak pine woodland at Folsom Reservoir as a result of construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure V-1:** Compensate for loss of 4.8 acres of oak and pine-oak woodland	LS	2
		Mitigation Measure V-3: Compensate for loss of 29.8 acres of oak and pine woodland	LS	3, 4, 8
		Mitigation Measure V-5: Compensate for loss of 6.7 acres of oak and pine woodland	LS	5, 6, 8
		Mitigation Measure V-7: Compensate for loss of 25.3 acres of oak and pine woodland	LS	7

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.8 Vegetation (Continued)				
Adversely affect jurisdictional waters of the United States and associated riparian and wetland vegetation communities as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure V-2:** Compensate for loss of 1.3 acres of riparian woodland	LS	2
		Mitigation Measure V-4: Compensate for Loss of 10.3 acres of riparian woodland	LS	3, 4, 8
		Mitigation Measure V-6: Compensate for Loss of 23.2 acres of riparian woodland	LS	5, 6, 8
		Mitigation Measure V-8: Compensate for Loss of 48.2 acres of riparian woodland	LS	7
Loss of special-status plants during construction of flood control improvements at Folsom Reservoir	LS	None Required		2, 3, 4, 5, 6, 7, 8
Adversely affect common natural vegetation communities along the Lower American River, the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta Sloughs as a result of activities associated with the construction of flood control improvements	LS	None Required	LS	5, 6, 7, 8
Operation-related effects				
Adversely affect vegetation at Folsom Reservoir, along the Lower American River, or in the Yolo and Sacramento Bypasses	NE	None Required	NE	1
Adversely affect vegetation downstream of L. L. Anderson Dam	NE	None Required	NE	2, 3, 4, 8
Adversely affect natural vegetation communities at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Adversely affect vegetation along the Lower American River and the Yolo and Sacramento Bypasses	LS	None Required	LS	5, 6, 7, 8
7.9 Wildlife				
Construction-related effects				
Adversely affect wildlife habitat or species abundance	NE	None Required	NE	1

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.9 Wildlife (Continued)				
Temporarily disturb nesting raptors in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	S	**Mitigation Measure W-1:** Conduct preconstruction raptor survey at L. L. Anderson Dam	LS	2, 3, 4, 8
Adversely affect cliff swallows in the vicinity of L. L. Anderson Dam as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Temporarily disturb nesting raptors in the vicinity Folsom Reservoir as a result of construction activities associated with raising wing dams and dikes at Folsom Reservoir	S	**Mitigation Measure W-2:** Conduct preconstruction raptor survey.	LS	2, 3, 4, 8
Cause the removal of elderberry shrubs from Folsom Reservoir as a result of activities associated with raising wing dams and dikes, the construction of a temporary bridge, and the operation of borrow sites at Folsom Reservoir	S	**Mitigation measure W-3:** Compensate for loss of elderberry shrubs	LS	2, 3, 4, 8
Temporarily disturb nesting raptors as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	**Mitigation Measure W-2:** Conduct preconstruction survey for Swainson's hawk	LS	5, 6, 7, 8
Affect potential VELB habitat as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	**Mitigation measure W-3:** Compensate for loss of elderberry shrubs	LS	5, 6, 7, 8
Increase the mortality of burrowing owls as a result of activities associated with the construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	**Mitigation Measures W-4:** Conduct burrowing owl surveys	LS	5, 6, 7, 8
Affect giant garter snakes and their habitat as a result of activities associated with the construction of flood control improvements along the Yolo and Sacramento Bypasses	S	**Mitigation Measure W-5:** Based on consultation with USFWS, avoid and minimize loss of giant garter snake habitat	LS	5, 6, 7, 8
Affect cliff swallows as a result of construction activities associated with bridge and railroad trestle modifications along the Lower American River	S	**Mitigation Measure W-6:** Examine bridges for use by cliff swallows	LS	7

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
Adversely affect nesting colonies of bank swallows as a result of activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure W-7:** Conduct preconstruction bank swallow surveys	LS	7
Operation-related effects				
Adversely affect wildlife habitat or species abundance	NE	None Required	NE	1
Affect wetlands, grasslands, and riparian areas that provide habitat for common and special-status wildlife species at Folsom Reservoir as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect blue oak-foothill pine woodlands, oak woodlands, and chaparral areas that provide habitat for common and special-status wildlife species at Folsom Reservoir as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect elderberry shrubs and valley elderberry longhorn beetle as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect potential but unoccupied California red-legged frog, foothill yellow-legged frog and California horned lizard habitat in tributaries of Folsom Reservoir and the upper American River as a result of infrequent flood storage at higher water surface elevations	LS	None Required	LS	2, 3, 4, 8
Affect wildlife or wildlife habitat along the Lower American River or the Yolo and Sacramento Bypasses	LS	None Required	LS	5, 6, 7, 8
7.10 Water Quality				
Construction-related effects				
Impair water quality in Folsom Reservoir, the Lower American River, or the Yolo or Sacramento Bypasses	NE	None Required	NE	1
Impair water quality in the Middle Fork of the American River with sediment derived from ground-disturbing activities associated with the modification of the L. L. Anderson Dam spillway	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.10 Water Quality (Continued)				
Affect water quality at Folsom Reservoir	NE	None Required	NE	5, 7
Impair water quality in Folsom Reservoir and the Lower American River with sediment derived from ground-disturbing activities associated with the construction of a new outlet at Folsom Dam	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	6
Impair water quality in Folsom Reservoir and the Lower American River with sediment derived from ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	2, 3, 4, 8
Impair water quality at Folsom Reservoir and Lake Natoma with sediment derived from the excavation and transport of dredge materials from the Mississippi Bar borrow site	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	3, 4, 8
Impair water quality in the Lower American River with sediment derived from ground-disturbing activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures. **Mitigation Measure WQ-2:** Implement erosion control measures.	LS	5, 6, 7, 8
Impair water quality in the Yolo and Sacramento Bypasses, and along the Delta sloughs with sediment derived from ground disturbing activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures. **Mitigation Measure WQ-2:** Implement erosion control measures.	LS	5, 6, 7, 8
Operation-related effects				
Impair water quality in Folsom Reservoir, the Lower American River, or the Yolo or Sacramento Bypasses	B	N/A	B	1
Impair water quality in Folsom Reservoir	NE	None Required	NE	5, 6, 7
Impair water quality in Folsom Reservoir and the Lower American River with sediment derived from flood control operations at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Impair water quality in the Lower American River with sediment derived bed and bank erosion along the Lower American River	LS	None Required	LS	5, 6, 7, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.11 Cultural Resources				
Construction-related effects				
Adversely affect cultural resources	NE	None Required	NE	1
Affect undiscovered cultural resources in the vicinity of French Meadows Reservoir as a result of activities associated with the modification of the L. L. Anderson Dam spillway	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project.	LS	2, 3, 4, 8
Affect buried cultural resources in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	S	**Mitigation Measure C-2:** Stop work in case of discovery of cultural resources	LS	2, 3, 4, 8
Affect undiscovered cultural resources at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project.	LS	2, 3, 4, 8
Affect buried cultural resources at Folsom Reservoir as a result of ground-disturbing activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure C-2:** Stop work in case of discovery of cultural resources	LS	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.11 Cultural Resources (Continued)				
Affect potentially significant historic structures at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project. **Mitigation Measure C-3:** Evaluate properties for eligibility for listing in the CRHR	LS	2, 3, 4, 8
Affect potentially significant historic structures associated with Folsom Dam as a result of construction activities conducted during the construction of a new outlet at Folsom Dam	S	**Mitigation Measure C-3:** Evaluate properties for eligibility for listing in the CRHR	LS	6
Adversely affect undiscovered cultural resources at Mississippi Bar as a result of using Mississippi Bar as a borrow site	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project.	LS	3, 4, 8
Adversely affect buried cultural resources at Mississippi Bar as a result of ground-disturbing activities associated with using Mississippi Bar as a borrow site	S	**Mitigation Measure C-2:** Stop work in case of discovery of cultural resources	LS	3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.11 Cultural Resources (Continued)				
Adversely affect known cultural resources along the Lower American River as a result of activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project. **Mitigation Measure C-3:** Evaluate properties for eligibility for listing in the CRHR	LS	5, 6, 7, 8
Adversely affect undiscovered cultural resources along the Lower American River as a result of activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement	LS	5, 6, 7, 8
Adversely affect buried cultural resources along the Lower American River as a result of ground-disturbing activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement	LS	5, 6, 7, 8
Adversely affect historic structures along the Lower American as a result of construction activities associated with the modification of a UPRR trestle	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement **Mitigation Measure C-3:** Evaluate properties for eligibility for listing in the CRHR	LS	7
Adversely affect undiscovered cultural resources in the Yolo and Sacramento Bypasses as a result of construction activities associated with the modification of the Sacramento Weir, Yolo Bypass, Sacramento Bypass, and levees in the Delta	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement	LS	5, 6, 7, 8
Adversely affect potentially significant cultural resources in the Yolo Bypass as a result of construction activities associated with the modification of levees in the Yolo Bypass	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement	LS	5, 6, 7, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
Adversely affect NRHP-listed cultural resources in the Yolo Bypass as a result of construction activities associated with the modification of levees in the Yolo Bypass	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement	LS	5, 6, 7, 8
Adversely affect buried cultural resources in the Yolo Bypass as a result of construction activities associated with the modification of levees in the Yolo Bypass	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement	LS	5, 6, 7, 8
Operation-related effects				
Adversely affect cultural resources	NE	None Required	NE	1, 5, 6, 7
Adversely affect undiscovered cultural resources in the inundation zone of Folsom Reservoir as a result of fluctuating reservoir levels and human activities	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement	LS	2, 3, 4, 8
7.12 Traffic and Circulation				
Construction-related effects				
Affect traffic or roadway circulation	NE	None Required	NE	1
Affect traffic and circulation on roadways in the vicinity of L. L. Anderson Dam as a result of trips generated by employees and construction equipment involved with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Affect traffic and circulation on roadways in the vicinity of L. L. Anderson Dam as a result of blasting operations associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Affect traffic and circulation on the roadway system around Folsom Reservoir as a result of trips generated by employees and equipment involved with the modification of Folsom Dam and associated wing dams and dikes	LS	None Required	LS	2, 3, 4, 6, 8
Affect traffic safety on roadways around Folsom Reservoir as a result of sight distance problems created by slow-moving trucks involved with the modification of Folsom Dam and associated wing dams and dikes	S	**Mitigation Measure T-1:** Prepare and implement a traffic safety plan	LS	2, 3, 4, 6, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.12 Traffic and Circulation (Continued)				
Affect traffic and circulation on Folsom-Auburn Road as the result of constructing a new signalized intersection at the intersection of Folsom-Auburn Road and the northern approach road to the temporary construction bridge	S	**Mitigation Measure T-2:** Conduct operational analysis and ensure signals are timed correctly	LS	2, 3, 4, 8
Affect traffic and circulation on Folsom Dam Road as a result of delays caused by construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Affect traffic and roadway circulation as a result of trips generated by employees and equipment involved with the construction of flood control improvements along the Lower American River, the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta sloughs	LS	None Required	LS	5, 6, 7, 8
Affect roadway safety as a result of trips generated by employees and equipment involved with the construction of flood control improvements along the Lower American River, the Yolo and Sacramento Bypasses, the Sacramento River, and the Delta sloughs	S	**Mitigation Measure T-1:** Prepare and implement a traffic safety plan	LS	5, 6, 7, 8
Affect traffic and circulation on Howe Avenue as a result of construction activities associated with increasing the height of Howe Avenue Bridge	LS	None Required	LS	7
Restrict pedestrian and bicycle access to the Sacramento State campus or the Campus Commons area as a result of construction activities associated with increasing the height of Guy West Bridge.	LS	None Required	LS	7
Affect railroad traffic as a result of activities associated with the construction of a floodgate over UPRR tracks on the right bank levee of the Lower American River	LS	None Required	LS	7
Operation-related effects				
Affect traffic and roadway circulation	NE	None Required	NE	1, 2, 3, 5, 6, 8
Affect traffic and circulation on some segments of Salmon Falls Road, Beaks Bight Road, and the access road to Newcastle Powerhouse as a result of temporary inundation during flood events	LS	None Required	LS	4

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.12 Traffic and Circulation (Continued)				
Affect railroad traffic on the UPRR bridge over the American River as a result of temporary closures during flood events	LS	None Required	LS	7
7.13 Air Quality				
Construction-related effects				
Reduce air quality by exceeding air quality standards and thresholds during construction	NE	None Required	NE	1
Reduce air quality by exceeding air quality standards during the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Reduce air quality by exceeding emission standards for ROG and NO_X during the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure AQ-1:** Incorporate and Implement Air Quality Measures for NO_X in the Construction Management Plan. **Mitigation Measure AQ-2:** Purchase NO_X Emission Credits.	S/LS	2
Reduce air quality by exceeding emission standards for ROG, NO_X, CO, and PM10 during construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure AQ-1:** Incorporate and Implement Air Quality Measures for NO_X in the Construction Management Plan. **Mitigation Measure AQ-2:** Purchase NO_X Emission Credits. **Mitigation Measure AQ-3:** Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan.	S/LS	3, 4, 5, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.13 Air Quality (Continued)				
Reduce air quality by exceeding emission standards for ROG, NO_X, CO, and PM10 during construction of flood control improvements along the Lower American River and the Yolo and Sacramento Bypasses	S	**Mitigation Measure AQ-1:** Incorporate and Implement Air Quality Measures for NO_X in the Construction Management Plan. **Mitigation Measure AQ-2:** Purchase NO_X Emission Credits. **Mitigation Measure AQ-3:** Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan.	S/LS	5, 6, 7, 8
Operation-related effects on air quality	NE	None Required	NE	All
7.14 Noise				
Construction-related effects				
Increase noise levels	NE	None Required	NE	1
Temporarily increase noise levels near French Meadows Reservoir as a result of blasting operations associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with the modification of Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	LS	None Required	LS	6
Temporarily increase noise levels at Folsom reservoir as a result of activities associated with the construction of a temporary construction bridge and roadway near Folsom Dam	S	**Mitigation Measure N-1:** Develop and implement Noise Abatement Program	S	2, 3, 4, 8
Temporarily increase noise levels at an apartment complex near Folsom Reservoir as a result of diverting traffic onto the temporary construction bridge and roadway near Folsom Dam	S	**Mitigation Measure N-2:** Construct a sound wall between the temporary roadway and the apartment complex	S	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.14 Noise (Continued)				
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with the removal of the temporary bridge near Folsom Dam	LS	None Required	LS	2, 3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Temporarily increase noise levels at Folsom Reservoir as a result of construction activities associated with the modification of Dikes 1,2,3 ,7, and 8	S	**Mitigation Measure N-1:** Develop and implement Noise Abatement Program	S	2, 3, 4, 8
Temporarily increase noise levels in the vicinity of Lake Natoma as a result of excavation and hauling activities at the Mississippi Bar borrow site	S	**Mitigation Measure N-1:** Develop and implement Noise Abatement Program	S	3, 4, 8
Temporarily increase noise levels as a result of construction activities associated with the modification of levees, floodwalls, pumping stations, and utilities along the Lower American river.	S	**Mitigation Measure N-1:** Develop and implement Noise Abatement Program	S	5, 6, 7, 8
Temporarily increase noise levels as a result of activities associated with the construction of flood control improvements in the Yolo and Sacramento Bypasses and in the Delta Sloughs	LS	None Required	LS	5, 6, 7, 8
Temporarily increase noise levels as a result of construction activities associated with the modification of bridges along the Lower American River	S	**Mitigation Measure N-1:** Develop and implement Noise Abatement Program	S	7
Operation-related effects				
Adversely affect noise levels	NE	None Required	NE	All
7.15 Visual Resources				
Construction-related effects				
Change the character or quality of visual resources at Folsom Reservoir, along the Lower American River, or in the Yolo and Sacramento Bypasses	LS	None Required	LS	1

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.15 Visual Resources (Continued)				
Change the character or quality of visual resources at Folsom Reservoir	NE	None Required	NE	5, 7
Change the character and quality of visual resources near French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources near Folsom Dam as a result of constructing a temporary construction bridge below Folsom dam	LS	None Required	LS	2, 3, 4, 8
Change light and glare near Folsom Dam as a result of constructing a temporary construction bridge below Folsom Dam.	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources at Folsom Reservoir as a result of construction activities associated with the modification of existing wing dams and dikes	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources at Folsom Reservoir as a result of establishing a borrow site near Peninsula campground.	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources at Folsom Reservoir as a result of activities associated with the construction of a new outlet at Folsom Dam	LS	None Required	LS	6
Change the character and quality of visual resources at Folsom Reservoir as a result of construction activities associated with increasing the height of Folsom Dam Road	LS	None Required	LS	3, 4, 8
Change the character and quality of visual resources at Lake Natoma as a result of establishing a borrow site at Mississippi Bar	LS	None Required	LS	3, 4, 8
Change the character and quality of visual resources at Lake Natoma as a result of establishing a borrow material transfer and storage facility at Willow Creek Recreation Area	LS	None Required	LS	3, 4, 8
Change the character and quality of views along the Lower American River	NE	None Required	NE	2. 3, 4

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.15 Visual Resources (Continued)				
Change the character or quality of visual resources along the Lower American River as a result of construction activities associated with the modification of existing drainage facilities and pumps	LS	None Required	NE	5, 6, 7, 8
Change the character of views along the Lower American River as a result of construction activities associated with raising the Guy West, UPRR, and Howe Avenue bridges	LS	None Required	LS	7
Change the character or quality of visual resources along the Lower American River as a result of activities associated with the construction and modification of levees	S	**Mitigation Measure VR-1**: Levees modified or disturbed as a result of flood control activities shall be revegetated to the greatest extent possible.	LS	7
Change the character and quality of visual resources in the Garden Highway corridor as a result of constructing a slurry wall on the north levee between the NEMDC and the Sacramento River	NE	None Required	NE	5, 6, 7, 8
Change the character and quality of visual resources in the Garden Highway corridor as a result of constructing a landside stability berm on the north levee between the NEMDC and the Sacramento River	S	**Mitigation Measure VR-1**: Levees modified or disturbed as a result of flood control activities shall be revegetated to the greatest extent possible.	S	5, 6, 7, 8
Change the character and quality of views in the Yolo and Sacramento Bypasses	NE	None Required	NE	2, 3, 4
Change the character or quality of visual resources in the Yolo Bypass, along the Sacramento River, and along the Delta sloughs as a result of activities associated with the construction of flood control improvements	LS	None Required	LS	5, 6, 7, 8
Change the character or quality of visual resources in the vicinity of the Yolo Bypass, the Sacramento Bypass, or the Sacramento River as a result of excavating and transporting dredge material from borrow sites in West Sacramento	LS	None Required	LS	5, 6, 7, 8
Change the character or quality of visual resources in the vicinity of the Yolo Bypass, the Sacramento Bypass, or the Sacramento River as a result of construction activities associated with the modification of the Sacramento Weir and the north levee of the Sacramento Bypass	LS	None Required	LS	5, 6, 7, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.15 Visual Resources (Continued)				
Change the character or quality of views in the vicinity of Nimbus Dam as a result of constructing a floodwall around a portion of the Nimbus Fish Hatchery	LS	None Required	LS	7
Operation-related effects				
Change the character or quality of visual resources at Folsom Reservoir	NE	None Required	NE	5, 6, 7
Change the character or quality of visual resources at Folsom reservoir as a result of using additional flood storage capacity at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Change the character and quality of visual resources along the Lower American River	NE	None Required	NE	2, 3, 4
	LS	None Required	LS	5, 6, 7, 8
Change the character or quality of visual resources within the Yolo and Sacramento Bypasses	NE	None Required	NE	2, 3, 4
	LS	None Required	LS	5, 6, 7, 8
7.16 Public Health and Safety				
Construction-related effects				
Adversely affect public health and safety	NE	None Required	NE	1
Adversely affect public safety at French Meadows Reservoir as a result of potential use conflicts between recreation activities and construction activities associated with the modification of the L. L. Anderson Dam Spillway	S	**Mitigation Measures PSF-1:** Prepare and implement a public safety management plan	LS	2, 3, 4, 8
Adversely affect public safety at French Meadows Reservoir as a result of accidental hazardous material spills from construction operations associated with the modification of the L. L. Anderson Dam spillway	S	**Mitigation Measure PSF-2:** Implement a hazardous materials management plan	LS	2, 3, 4, 8
Increase the potential for wildfire in the vicinity of French Meadows Reservoir as a result of operating heavy equipment during the modification of the L. L. Anderson Dam spillway	S	**Mitigation Measure PSF-3:** Prepare and implement a fire management plan	LS	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.16 Public Health and Safety (Continued)				
Adversely affect public safety at Folsom Reservoir	NE	None Required	NE	5, 7
Adversely affect public safety at Folsom Reservoir as a result of potential use conflicts between recreation activities and construction activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measures PSF-1:** Prepare and implement a public safety management plan	LS	2, 3, 4, 6, 8
Adversely affect public safety at Folsom Reservoir as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure PSF-2:** Implement a hazardous materials management plan	LS	2, 3, 4, 6, 8
Increase the potential for wildfire in the vicinity of Folsom Reservoir as a result of operating heavy equipment during the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure PSF-3:** Prepare and implement a fire management plan	LS	2, 3, 4, 6, 8
Adversely affect public health as a result of the potential for hazardous materials to become exposed during the construction of flood control improvements to wing dams and dikes at Folsom Reservoir	S	**Mitigation Measure PSF-4:** Conduct environmental site assessments at all construction sites before beginning construction	LS	2, 3, 4, 8
Adversely affect public health an safety along te north and south forks of the American River	NE	None Required	NE	5, 6, 7, 8
Adversely affect public safety as a result of the potential for recreation activities to conflict with activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measures PSF-1:** Prepare and implement a public safety management plan	LS	5, 6, 7, 8
Adversely affect public safety along the Lower American River as a result of potential use conflicts between recreation activities and activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measures PSF-1:** Prepare and implement a public safety management plan	LS	5, 6, 7, 8
Adversely affect public safety along the Lower American River as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure PSF-2:** Implement a hazardous materials management plan	LS	5, 6, 7, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.16 Public Health and Safety (Continued)				
Increase the potential for wildfire as a result of operating heavy equipment during the construction of flood control improvements along the Lower American River	S	**Mitigation Measure PSF-3:** Prepare and implement a fire management plan	LS	5, 6, 7, 8
Adversely affect public safety as a result of accidental hazardous material spills from construction operations associated with the construction of flood control improvements in the Yolo and Sacramento Bypasses	S	**Mitigation Measure PSF-2:** Implement a hazardous materials management plan	LS	5, 6, 7, 8
Increase the potential for wildfire as a result of operating heavy equipment during the construction of flood control improvements in the Yolo and Sacramento Bypasses	S	**Mitigation Measure PSF-3:** Prepare and implement a fire management plan	LS	5, 6, 7, 8
Operation-related effects				
Adversely affect public health and safety	NE	None Required	NE	1
Adversely affect public health and safety at French Meadows Reservoir	NE	None Requiredd	NE	2, 3, 4, 8
Adversely affect public safety at Folsom Reservoir as a result of increasing the storage capacity of the reservoir	LS	None Required	LS	2, 3, 4, 8
Adversely affect public safety at and upstream of Folsom Reservoir as a result of the temporary inundation of segments of the north and south forks of the American River	LS	None Required	LS	2, 3, 4, 8
Adversely affect public safety on the Lower American River	NE	None Required	NE	5, 6, 7
	LS	None Required	LS	2, 3, 4, 8
Adversely affect public safety in the Yolo and Sacramento Bypasses	LS	None Required	LS	2, 3, 4, 8
Adversely affect public safety in the Yolo and Sacramento Bypasses as a result of temporary inundation of portions of the East Yolo County Landfill	LS	None Required	LS	5, 6, 7, 8
7.17 Public Services				
Construction-related effects				
Adversely affect public services	NE	None Required	NE	1

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.17 Public Services (Continued)				
Adversely affect public services in the vicinity of French Meadows Reservoir as a result of construction activities associated with the modification of the L. L. Anderson Dam spillway	LS	None Required	LS	2, 3, 4, 8
Adversely affect emergency services at Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Adversely affect the ability of San Juan Water District, the City of Folsom, or Folsom Prison to divert water from Folsom Reservoir as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	LS	None Required	LS	2, 3, 4, 8
Adversely affect utility services and utility-dependent public services as a result of activities associated with the construction of flood control improvements at Folsom Reservoir	S	**Mitigation Measure PSV-1:** Identify utility infrastructure components prior to construction	LS	2, 3, 4, 8
Adversely affect public services at Lake Natoma as a result of construction activities at Mississippi Bar borrow site	NE	None Required	NE	3, 4, 8
Adversely affect emergency services as a result of activities associated with the construction of flood control improvements along the Lower American River	LS	None Required	LS	5, 6, 7, 8
Adversely affect utility services as a result of damage caused by activities associated with the construction of flood control improvements along the Lower American River	S	**Mitigation Measure PSV-1:** Identify utility infrastructure components prior to construction	LS	5, 6, 7, 8
Adversely affect utility services as a result of damage caused by activities associated with the construction of flood control improvements in the Yolo and Sacramento Bypasses	S	**Mitigation Measure PSV-1:** Identify utility infrastructure components prior to construction	Ls	5, 6, 7, 8
Operation-related effects				
Adversely affect public services	NE	None Required	NE	1
Adversely affect public services at French Meadows Reservoir	NE	None Required	NE	2, 3, 4, 8

TABLE S-2. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.17 Public Services (Continued)				
Adversely affect emergency services at Folsom Reservoir as a result of flood control operations	NE	None Required	NE	2, 3, 4, 8
Adversely affect emergency services at Folsom Reservoir as a result of flood storage operations	NE	None Required	NE	2, 3, 4, 8
Adversely affect sewage lift stations at Browns Ravine and Granite Bay, and vault toilets at Skunk Hollow and Salmon Falls as a result of flood control operations	LS	None Required	LS	2, 3, 4, 8
Adversely affect emergency services as a result of infrequent, short-term flooding over Green Valley Road and Salmon Falls Road	LS	None Required	LS	4
Adversely affect public services along the Lower American River as a result of flood control operations	LS	None Required	LS	2, 3, 4, 5, 6 , 7, 8
Adversely affect public services in the Yolo and Sacramento Bypasses as a result of flood control operations	NE	None Required	NE	2, 3, 4, 5, 6, 7, 8

Notes:

[a] B = beneficial effect
LS = less-than-significant effect
NE = no effect
S = significant effect

CRHR = California Register of Historic Resources
NRHP = National Register of Historic Places

TABLE S-3. Summary of Effects and Mitigation Measures of Project Alternatives 9.1 through 9.5

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.1 Hydrology and Hydraulics				
Construction-related effects				
Change river hydrology and hydraulics	LS	None Required	LS	9.1, 9.2, 9.3, 9.4, 9.5
Operation-related effects				
Adversely affect river hydrology and hydraulics	LS	None Required	LS	9.1, 9.2, 9.3, 9.4, 9.5
7.2 Geology, Seismicity, and Soils				
Construction-related effects				
Cause substantial soil erosion and/or the loss of topsoil as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required	NE	9.5
Cause substantial soil erosion and/or the loss of topsoil as a result of ground-disturbing activities associated with the construction of the floodplain ecosystem restoration alternatives	S	**Mitigation Measure WQ-2:** Implement erosion control measures.	LS	9.1, 9.2., 9.3, 9.4
Operation-related effects				
Substantial soil erosion and/or the loss of topsoil as a result of the terracing and riparian planting components of the floodplain ecosystem restoration alternatives	B	N/A	B	9.1, 9.3
Substantial soil erosion and/or the loss of topsoil as a result of alterations made to the north-south borrow channel at the Woodlake restoration site	B	N/A	B	9.2
Cause substantial soil erosion and/or the loss of topsoil as a result of operating low-gradient floodplain channels	LS	None Required	LS	9.3
Cause substantial soil erosion and/or the loss of topsoil as a result of operating a high-flow bypass channel	LS	None Required	LS	9.4
Cause substantial soil erosion during the operation of the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required	NE	9.5

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.3 Water Supply				
Construction-related effects				
Adversely affect water storage at Folsom Reservoir or diversion facilities along the Lower American River	NE	None Required	NE	9.1, 9.2, 9.3, 9.4, 9.5
Operation-related effects				
Adversely affect water storage at Folsom Reservoir	NE	None Required	NE	All
7.4 Hydropower				
Construction-related effects				
Adversely affect hydropower production at Folsom Dam or Nimbus Dam powerhouses as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	NE	None Required	NE	9.1, 9.2, 9.3, 9.4
Adversely affect hydropower production at Folsom Dam powerhouse as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	LS	None Required	LS	9.5
Operation-related effects				
Adversely affect hydropower production	NE	None Required	NE	All
7.5 Land Use and Socioeconomics				
Construction-related effects				
Change or conflict with land use within the American River Parkway as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	NE	None Required	NE	9.1, 9.2, 9.3, 9.4
Change or conflict with land use at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative	NE	None Required	NE	9.5

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.5 Land Use and Socioeconomics (Continued)				
Operation-related effects				
Change or conflict with land use at the Folsom Reservoir and/or along the Lower American River	NE	None Required	NE	All
7.6 Recreation				
Construction-related effects				
Disrupt recreation along the Lower American River as a result of the activities associated with the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Disrupt recreation activities at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative	NE	None Required	NE	9.5
Operation-related effects				
Adversely affect recreation activities at Folsom Reservoir and/or along the Lower American River	NE	None Required	NE	All
7.7 Fisheries				
Construction-related effects				
Affect fish and fish habitat in the Lower American River as a result of sediment, fuels, and lubricants being discharged into the river during the construction of the floodplain ecosystem restoration alternatives	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	9.1, 9.2, 9.3, 9.4
Affect fish and fish habitat in the Lower American River as a result of reducing riparian vegetation and shaded riverine aquatic cover habitat during the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.7 Fisheries (Continued)				
Affect fish and fish habitat in Folsom Reservoir as a result of fuels and lubricants being discharged into the reservoir during the construction of the fisheries ecosystem restoration alternative	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	9.5
Operation-related effects				
Affect fish and fish habitat in the Lower American River as a result of operating the floodplain ecosystem restoration alternatives along the Lower American River	B	N/A	B	9.1, 9.2, 9.3, 9.4
Affect fish and fish habitat in the Lower American River as a result of operating the fisheries ecosystem restoration alternative	B	N/A	B	9.5
7.8 Vegetation				
Construction-related effects				
Affect vegetation along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Affect vegetation at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative	NE	None Required	NE	9.5
Operation-related effects				
Short-term loss of vegetation along the Lower American River as a result of operating the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Establish native vegetation along the Lower American River as a result of operating the floodplain ecosystem restoration alternatives	B	N/A	B	9.1, 9.2, 9.3, 9.4
Affect vegetation as a result of operating the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required	NE	9.5

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.9 Wildlife				
Construction-related effects				
Adversely affect nesting raptors along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	**Mitigation Measure W-1:** Conduct preconstruction raptor survey. **Mitigation Measure W-3:** Conduct preconstruction survey for Swainson's hawk	LS	9.1, 9.2, 9.3, 9.4
Adversely affect nesting colonies of bank swallows along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	**Mitigation Measure W-7:** Conduct preconstruction bank swallow surveys	LS	9.1, 9.2, 9.3, 9.4
Adversely affect valley elderberry longhorn beetle along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Adversely affect wildlife habitat at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	LS	None Required	LS	9.5
Operation-related effects				
Adversely affect wildlife habitat	LS	None Required	LS	All
7.10 Water Quality				
Construction-related effects				
Impair water quality in the Lower American River with sediment derived from ground-disturbing activities associated with the construction of the floodplain ecosystem restoration alternatives	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	9.1, 9.2, 9.3, 9.4

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.10 Water Quality (Continued)				
Impair water quality in Folsom Reservoir with fuels and lubricants used during the construction of the fisheries ecosystem restoration alternative at Folsom Dam	S	**Mitigation Measure WQ-1:** Implement pollution prevention measures.	LS	9.5
Operation-related effects				
Create short-term affects on water quality in the Lower American River	LS	None Required	LS	9.1, 9.2, 9.4
Create long-term affects on water quality in the Lower American River	B	N/A	B	All
7.11 Cultural Resources				
Construction-related effects				
Adversely affect undiscovered cultural resources along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	S	**Mitigation Measure C-1:** Implement a Programmatic Agreement among the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, California State Historic Preservation Officer, and the Advisory Council on Historic Preservation regarding implementation of the American River Watershed Project.	LS	9.1, 9.2, 9.3, 9.4
Adversely affect buried cultural resources along the Lower American River as a result of ground-disturbing activities associated with the construction of the floodplain ecosystem restoration alternatives	S	**Mitigation Measure C-2:** Stop work in case of discovery of cultural resources	LS	9.1, 9.2, 9.3, 9.4
Adversely affect cultural resources at the Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternatives	NE	None Required	NE	9.5

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.11 Cultural Resources (Continued)				
Operation-related effects				
Adversely affect cultural resource	NE	None Required	NE	All
7.12 Traffic and Circulation				
Construction-related effects				
Adversely affect traffic and circulation of the local roadway system as a result of trips generated by employees and equipment involved with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Adversely affect traffic safety on local roadways as a result of sight distance problems created by slow-moving trucks involve with the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	**Mitigation Measure T-1:** Prepare and implement a traffic safety plan	LS	9.1, 9.2, 9.3, 9.4
Adversely affect traffic and roadway circulation on Folsom Dam Road as a result of trips generated by employees and equipment involved with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	LS	None Required	LS	9.5
Operation-related effects				
Adversely affect traffic, circulation, and traffic safety on local roadways	NE	None Required	NE	All

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.13 Air Quality				
Construction-related effects				
Impair air quality by exceeding emission standards for NO_X and PM10 during the construction of the floodplain ecosystem restoration alternatives along the Lower American River	S	**Mitigation Measure AQ-1:** Incorporate and Implement Air Quality Measures for NO_X in the Construction Management Plan. **Mitigation Measure AQ-2:** Purchase NO_X Emission Credits. **Mitigation Measure AQ-3:** Incorporate and Implement Air Quality Measures for PM10 in the Construction Management Plan.	LS	9.1, 9.2, 9.3, 9.4
Impair air quality during the construction of the fisheries ecosystem restoration alternative at Folsom Dam	LS	None Required	LS	9.5
Operation-related effects on air quality				
Impair air quality	NE	None Required	NE	All
7.14 Noise				
Construction-related effects				
Temporarily increase noise levels as a result of activities associated with the construction of the Urrutia or Arden Bar floodplain ecosystem restoration alternatives along the Lower American River	S	**Mitigation Measure N-1:** Develop and implement Noise Abatement Program	S	9.1, 9.4
Temporarily increase noise levels as a result of activities associated with the construction of the Arden Bay or Bushy Lake floodplain ecosystem restoration alternatives along the Lower American River	LS	None Required	LS	9.2, 9.3
Temporarily increase noise levels resulting from activities associated with the construction of the fisheries ecosystem restoration alternative	LS	None Required	LS	9.5

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.14 Noise (Continued)				
Operation-related effects				
Increase noise levels	NE	None Required	NE	All
7.15 Visual Resources				
Construction-related effects				
Change the character and quality of visual resources along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives in the American River Parkway	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Change the character and quality of visual resources at Folsom Reservoir as a result of activities associated with the construction of the fisheries ecosystem restoration alternative at Folsom Dam	NE	None Required	NE	9.5
Operation-related effects				
Change the character and quality of visual resources	NE	None Required	NE	All
7.16 Public Health and Safety				
Construction-related effects				
Adversely affect construction worker and public safety as a result of accidental hazardous material spills, uncovering hazardous wastes, and increased wildfire risk from construction operations associated with the construction of the floodplain ecosystem restoration alternatives	S	**Mitigation Measures PSF-1:** Prepare and implement a public safety management plan **Mitigation Measure PSF-2:** Implement a hazardous materials management plan **Mitigation Measure PSF-3:** Prepare and implement a fire management plan **Mitigation Measure PSF-4:** Conduct environmental site assessments at all construction sites before beginning construction	LS	9.1, 9.2, 9.3, 9.4

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.16 Public Health and Safety (Continued)				
Adversely affect construction worker and public safety as a result of accidental hazardous material spills from construction operations associated with the construction of the fisheries ecosystem restoration alternatives	S	**Mitigation Measures PSF-1:** Prepare and implement a public safety management plan **Mitigation Measure PSF-2:** Implement a hazardous materials management plan **Mitigation Measure PSF-4:** Conduct environmental site assessments at all construction sites before beginning construction	LS	9.5
Adversely affect construction worker and public safety as a result of uncovering hazardous wastes and increased wildfire risk from construction operations associated with the construction of the fisheries ecosystem restoration alternatives	LS	None Required	LS	9.5
Operation-related effects				
Adversely affect public health and safety	NE	None Required	NE	9.1, 9.2, 9.4., 9.5
Adversely affect public health as a result of increased nuisance mosquito conditions associated with the hydraulic detention of water at the Bushy Lake restoration site	LS	None Required	LS	9.4
7.17 Public Services				
Construction-related effects				
Adversely affect public services along the Lower American River as a result of activities associated with the construction of the floodplain ecosystem restoration alternatives	LS	None Required	LS	9.1, 9.2, 9.3, 9.4
Adversely affect public services at Folsom Dam as a result of activities associated with the construction of the fisheries ecosystem restoration alternatives	NE	None Required	NE	9.5

TABLE S-3. Continued

Resource/Effect	LOS Before Mitigation [a]	Mitigation	LOS After Mitigation [a]	Applicable Alternatives
7.17 Public Services (Continued)				
Operation-related effects				
Adversely affect public services	NE	None Required	NE	All

Notes:

[a] B = beneficial effect
LS = less-than-significant effect
NE = no effect
S = significant effect